



PLANNING DOCUMENT

Grazing Component (Plan) and Environmental Assessment

February 8, 1999

ENVIRONMENTAL ASSESSMENT FACE SHEET

DATE: December 28, 1998

COMPLIANCE FILE/PROJECT NUMBER: GLCA-EA98-002

PROJECT TITLE: Grazing Management Plan

PROJECT LOCATION: Glen Canyon National Recreation Area

LAND STATUS VERIFIED: NPS X YES ___ NO; Other: ___ City ___ State ___ BLM

AFFECTED SURFACE AREA: 915,000 AC.

AFFECTED ZONE CLASSIFICATION: NATURAL X ; RECREATION and RESOURCE
UTILIZATION X ; DEVELOPMENT X ; OTHER Cultural.

QUAD NAME (15 '): Entire Recreation Area

CONFORMANCE WITH GLEN CANYON NRA GENERAL MANAGEMENT PLAN (GMP), 1979.

Grazing is authorized by the Enabling Legislation for Glen Canyon National Recreation Area (P.L.92-593). A "Grazing Resources Component" is one of four Resource Management Components listed as a future planning need at TABLE 4 (p. 12), and listed as a Level III objective at Table 1(p. 6) in the GMP. The objective of Glen Canyon NRA is "To manage mineral and grazing use in accordance with the preservation of "scenic, scientific, and historic features contributing to public enjoyment of the area." The Proposed Action in this Environmental Assessment (EA) will fulfill the GMP planning requirement.

In addition, the GMP was reviewed to ensure management actions comply with land use requirements on grazing within the various land use zones. There will be **no** grazing in Development Zones, and grazing may be prohibited or restricted in other zones, as identified in this Grazing Resources plan.

BACKGROUND

Lands within Glen Canyon National Recreation Area (NRA) were first used for livestock grazing 100 years prior to the establishment of the recreation area. Grazing has continued up to the present time as a use recognized by Congress in the act of 1972 establishing the recreation area. Working together, the Superintendent and the Bureau of Land Management (BLM) are to protect the values and purposes of the recreation area and administer grazing permits. This EA will educate participants in the grazing history and policies of Glen Canyon NRA and analyze the impacts of the grazing plan on the recreation area. It also offers an opportunity to the permittees, the public, and agency personnel interested in livestock grazing in Glen Canyon NRA to assist in the plan implementation.

The enabling legislation for Glen Canyon NRA directs that administration of grazing permits within the recreation area shall be by the BLM. BLM accomplishes this through six BLM resource area offices in Utah (five) and Arizona (one). These areas are now identified as either Field Offices or Field Stations. The offices are located in the San Rafael, Henry Mountain, San Juan, Kanab, Escalante, Vermilion and Grand Staircase – Escalante National Monument field areas. BLM is to accomplish this administration by applying the "...same policies [notably the 1934 Taylor Grazing Act (43 U.S.C. 315 et seq.), as amended, and the 1976 Federal Land Policy and Management Act (43 U.S.C. 1701 et seq.)] followed by the BLM in issuing and administering... grazing leases on other lands under its jurisdiction subject to the Glen Canyon NRA enabling legislation Section 4 which states that "The Secretary shall administer, protect, and develop the recreation area in accordance with the provisions of the Act of August 25, 1916 (16 U.S.C. 1a et seq.), as amended and supplemented and with other statutory authority available to him for conservation and management of natural resources to the extent he finds such authority will further the purpose of this Act". In the case of Glen Canyon NRA, all allotments are administered as livestock "Grazing permits" as the public lands used are within grazing districts as defined under Section 3 of the 1934 Taylor Grazing Act, as amended.

The Grazing Program

Before BLM authorized officials approve or implement a change in a grazing permit they should receive a Values and Purposes Determination from the Superintendent of Glen Canyon NRA. "Changes" include the following actions: A change in kind of livestock or change in the season of use; new, reconstruction or major maintenance of existing range improvements; a new or modified allotment management plan; a new grazing system; or new resource monitoring or evaluation efforts; This Determination documents that the Superintendent has completed an assessment of the potential effects of the proposal on the values and purposes of the recreation area ("Umbrella" Memorandum of Understanding, BLM/NPS 1984 and Interagency Agreement, BLM/NPS 1993). The Determination may recommend authorizing the proposed action (no impact

I. Purpose and Need for the Proposed Action

The purpose of the grazing plan is defined on page 12 of the 1979 General Management Plan (GMP). Glen Canyon NRA shall complete the grazing resources component of the GMP to provide a "...detailed description of the range, recommendations for specific range improvement practices and devices, management activities and maximum grazing intensities compatible with the purpose of the recreation area". Achieving the goals and objectives of this plan will meet those requirements.

In the past there were no established criteria for a "values and purposes determination." The assessment, review and approval process conducted by the Glen Canyon NRA natural resources staff, on a case-by-case basis, was to insure that proposed actions did not conflict with the values and purposes of Glen Canyon NRA. The proposed plan clearly identifies the process, and the values and purposes used in the assessment of future actions on the part of the permittees, the BLM, and the Glen Canyon NRA management staff.

The proposed plan also provides information on existing grazing management policy (an overview of grazing conditions within Glen Canyon NRA, a brief description of BLM grazing management on other lands under its jurisdiction, and on allotments within the recreation area). It also describes the resource criteria to be used to assess potential impacts from a proposed action (value statement, current condition, management goal, objectives and methods), and outlines achievement of the objective and monitoring requirements for each resource.

Descriptions of the "values" of recreation area resources and the management goal for each resource are provided. Each resource goal is supported by objectives designed to meet or obtain that goal set for that particular resource (see Resource Value, Goal and Objectives). If a proposed action meets these objectives, or can meet them by incorporating prescribed mitigation requirements, the action will be considered to have complied with the "purposes" of the recreation area. The Superintendent will recommend that it be approved by the BLM authorizing official.

The need for this plan is established in the Glen Canyon NRA enabling legislation. The legislation states that "grazing permits will be administered by the BLM" subject to the requirement that the Secretary "shall administer, protect and develop the recreation area in accordance with the NPS Organic act as amended and supplemented, and with other statutory authority available to him for the conservation and management of natural resources to the extent he finds such authority will further the purposes of the Glen Canyon NRA Act."

To ensure compliance with this mandate, the GMP for Glen Canyon NRA created a management objective "To manage...grazing use in accordance with the preservation of "scenic, scientific, and historic features contributing to public enjoyment of the area."

National Park System "The authorization of activities...shall not be exercised in derogation of the values and purposes for which these various areas have been established..."

Setting

The rangelands of Glen Canyon NRA occur in an arid to semi-arid climate, with annual rainfall varying from 4-12 inches per year in most localities. Winters are cold, with some precipitation falling as snow, while summers are hot. Precipitation is extremely variable from year to year and even within years between different portions of the recreation area. In drought years vegetative growth is reduced or often absent compared to wetter years. The vegetation of the region includes arid shrublands, grasslands and semi-arid pinyon-juniper woodlands. Much of the recreation area consists of talus, cliff, badlands formed by clay and slickrock which lacks vegetation or supports only scattered saltbush and annuals. Perennial grasslands are relatively rare in the recreation area, but provide much of the available forage for livestock. Stocking rates (acres/AUM) are generally low for western rangelands, reflecting the sparse vegetation cover of the region.

Glen Canyon NRA includes all or part of 35 grazing allotments encompassing approximately 915,000 acres. No livestock grazing is authorized in 5 of these allotments (approximately 120,000 acres), and two areas (Antelope Island and the Escalante River) covering approximately 57,000 acres are no longer grazed by livestock due to retirement of the grazing privileges through a willing seller/buyer arrangement. In addition, approximately 138,000 acres within Glen Canyon NRA are not within designated grazing allotments (See Appendix B for allotment specific data). The total suitable and unsuitable allotment acres per AUM vary from 10 acres (Upper Cattle Allotment) to 939 acres (Slickrock Allotment). For allotment categories, the figures are 10 to 133 acres for Improvement allotments, 12 to 76 acres for Maintenance allotments, and 22 to 67 acres for Custodial allotments. No category is reported for the Slickrock Allotment. However, the reported acres per AUM do not usually reflect the amount of acreage actually grazed. Portions of most allotments consist of cliffs, talus, slickrock and other areas where grazing cannot occur. Hence, grazable acres per AUM are generally lower than the cited values.

II. Description of the Proposed Action and Alternatives

Alternative 1: Proposed Action - Implement the Glen Canyon Grazing Management Component.

The Glen Canyon NRA grazing resources component (plan) is composed of several elements: 1) descriptions of the existing resource protection and grazing administrative responsibilities of the National Park Service and Bureau of Land Management; 2) an assessment of the current range condition by resource; 3) Goals, objectives and recommendations for grazing practices and

used to assess impacts associated with proposed changes in the existing grazing program. These goals and objectives will also be used to determine if changes in resource management or grazing administration are needed to protect Glen Canyon NRA resource values. The scenic, scientific and historic resources described in the plan contribute directly to the value of a visitor's recreation experience, use and enjoyment of Glen Canyon NRA. A value statement is made for each resource describing its relationship to the purpose and significance of the recreation area.

The 1979 GMP directed that the grazing plan provide a detailed description of the range. To meet this requirement, resource conditions are provided for each resource, and management goals and objectives for each resource (vegetation, soils, water quality, wildlife, cultural, paleontological/quaternary, scenic, and recreation) are described. The goals provide guidance to ensure that the full spectrum of environmental, ecological, cultural, and recreational values represented in Glen Canyon NRA are addressed. They ensure that the Superintendent will make a reasoned and informed decision regarding approval of proposed actions or development of needed mitigation requirements. They are to be applied when changes in grazing activity or ground disturbing actions, associated with grazing, occur. They have been developed to further the coordination and understanding between the BLM, NPS, and grazing permittees. In the future, consistent application of these goals and objectives in making "Values and Purposes Determinations" will prevent the frustration that historically occurred when proposals were reviewed on a case-by-case basis.

The plan objectives describe the information needed by the Superintendent to determine if a resource management goal can be met. If an objective is supported by the proposed action, the activity will be approved. Approval may include mitigation requirements as defined in this environmental assessment or as detailed in the final plan. This plan is aimed at encouraging sound grazing practices that minimize or avoid substantial negative impacts to recreation area resources. Present permittees, whose activities are not causing undue resource degradation, should not be unduly effected by the guidelines contained in the plan. The National Park Service will review all proposed actions, including proposed permit transfers that involve allotments where the resource condition is not satisfactory. All proposed actions in grazing allotments without an Allotment Management Plan (AMP) will be reviewed to meet NPS mandates and to protect recreation area resources.

Alternative 2: No Action - Selective Management of Rangeland

Current BLM policy is to concentrate available funding and personnel on areas where management action is most needed to improve resource condition, resolve serious resource-use conflicts, or where investments in range improvement will yield the greatest positive return. This approach is called selective management.

situation or objectives, and other criteria as appropriate. These three categories have been expected to take into account nearly all resource situations; however, special categories may be developed for allotments or areas requiring unique management objectives. Objectives for the three Primary categories are to; (1) maintain current satisfactory condition (M); (2) improve current unsatisfactory condition (I); and (3) manage custodially (C), while protecting existing resource values.

Of the 34 allotments in Glen Canyon NRA where livestock grazing is authorized, 16 are in the Improve category, 7 are in the Maintain category, and 4 are in the Custodial category, one allotment is not categorized, and 6 are not allocated. This type of grazing management would continue under this alternative, however efforts would be initiated to bring all allotments to "good" range condition.

Alternative 3: Follow Bureau of Land Management "Standards and Guidelines" (S&G's) within Glen Canyon NRA.

Since beginning the development of the grazing component, the Bureau of Land Management has developed new S&G's and revised some old grazing standards. The new S&G's are similar to those developed by the NPS for this grazing plan, and could be used to meet many NPS goals and objectives. However, there are differences between NPS objectives and the S&G's, and some resources of concern to NPS management are not addressed in the S&G's. Some NPS goals/objectives would be kept as is, but others would not be addressed using the S&G's developed for Arizona and Utah BLM. Implementation would be the same, to occur as new grazing leases are added or as existing permits are changed. Criteria for NPS values and purposes review would remain the same. Greater emphasis would be placed on ensuring lands within Glen Canyon NRA meet the S&G's as detailed for each state, and that grazing authorization for an allotment be tied to permittee performance in attaining the goals set by this plan. Allotments within the recreation area, not meeting existing S&G's, would be given a higher priority by BLM and NPS for S&G's implementation.

Alternative 4: Immediate permittee compliance with resource goals and objectives detailed in the NPS plan.

Under this alternative, upon completion and authorization of the NPS grazing plan discussed in Alternative 1, the BLM would require immediate implementation of NPS grazing practices on all allotments within Glen Canyon NRA to meet the NPS goals and objectives identified in Alternative 1. This would require an assessment of allotment condition and trend and inventories to determine the condition of other resources not presently understood.

Time frames would be established, in consultation with the BLM, NPS and permittee, in which the

III. Environmental Consequences of Proposed Action and Alternatives

VEGETATION

Values Statement:

Vegetation provides the basis for wildlife habitat, and produces the necessary forage for livestock. Healthy vegetation (with adequate cover and composition) inhibits soil erosion, maintains high water quality, regulates water quantity, and maintains the nutrient cycling essential for both plant and animal life. Native vegetation is of great scientific value, and provides for the scenic and aesthetic enjoyment by recreation area visitors.

Resource Condition

Domestic livestock has grazed the Colorado Plateau for more than 100 years (starting in the 1870's in most areas). Virtually all parts of the plateau accessible to livestock have been utilized. Relict areas (defined as native vegetation not altered by European influence) are generally found only in inaccessible areas, such as on isolated mesa tops and in canyons protected by cliffs (Tuhy and MacMahon 1988; Van Pelt *et al.* 1991). Because of the ubiquitous presence of livestock, it has been difficult to determine what the native presettlement vegetation would have been like in many areas. Relict vegetation sites are critical to our understanding of how the accessible desert and semi-desert vegetation of the Colorado Plateau has been affected by livestock grazing and related activities. Cole *et al.* (1997) used pack rat middens to show that a substantial change in vegetation had occurred at a site in Capitol Reef National Park following the introduction of domestic livestock. This approach holds much promise for constructing pre-settlement vegetation patterns.

Other factors that complicate our understanding of livestock effects include climate change and fire suppression. Since the late 1800's, the climate in the western U.S. has become slightly warmer, with changes in precipitation regimes. Also during this time, widespread fire suppression was initiated. The effects of climate change and fire on Colorado Plateau vegetation are poorly understood. Fire suppression will generally cause an increase in woody vegetation (some shrublands and especially pinyon-juniper woodlands) at the expense of grasslands, which recover more quickly from fire than most woody vegetation (West and Hassan 1985; West 1988). The combination of drought and grazing can destabilize arid and semiarid plant communities by reducing cover, destroying microphytic crusts, and increasing erosion. Information on conditions within Glen Canyon NRA is essential to understand how drought and grazing interact, but is not yet available.

Most studies done on the Colorado Plateau and adjacent parts of the Great Basin, are in general

(Hilaria jamesii) increase, as do undesirable native species like snakeweed (Gutierrezia sarothrae and G. microcephala). With more intense prolonged grazing the bunchgrasses can be completely eliminated, and the sod grasses can begin to decline. Exotics, especially cheatgrass (Bromus tectorum) then invade and dominate. In general, shrubs tend to increase throughout this sequence, although there are some exceptions, such as winterfat (Ceratoides lanata) and four-wing saltbush (Atriplex canescens), which are valuable browse species and tend to be decreasers. Annuals and perennial forbs vary in their response to grazing, with some not being affected, while others either decrease or increase.

The effects of livestock grazing on riparian zones on the Colorado Plateau and adjacent areas is less well understood than for upland vegetation (Rickard and Cushing 1982; Szaro and Pase 1983; Kauffman and Krueger 1984; Padgett et al. 1989; Szaro 1989). Little research has been done on the Colorado Plateau. Barth and McCullough (1988) documented severe impacts in Capitol Reef National Park, including trampling and collapse of streambanks, erosion, declines in native species, elimination of seedlings, and increases in undesirable species. Since cattle often concentrate in riparian zones because of water and shade, damage can be locally severe. The principal problems include collapse of streambanks, reduction of vegetation cover, and reduction in water quality. With the loss of banks and vegetation cover, floods can become more destructive, further damaging the riparian zone. Recovery can be relatively fast in riparian zones if cattle are removed (eg. Warren and Anderson 1987). Spence and Henderson (1993) noted that grazed waterpockets (tinajas) were significantly different from ungrazed tanks, exhibiting less vegetation cover and species richness.

Proper forage utilization levels are generally set at 50-60% or less for perennial species within the recreation area. However, locally utilization can be much higher. For example, severe overgrazing occurred in the Red Wells area of the Forty-Mile Ridge allotment (Escalante Resource Area) in the 1993-94 season, with utilization of key grass species at 78-88%. Many plants were killed outright, with their roots pulled out of the ground. Other plants were so severely cropped that it is unlikely that they will survive given future drought conditions. Data from the Upper Cattle Allotment in the 1990-91 season (Escalante Resource Area) shows utilization in some pastures of 85% (sand dropseed), 86% (indian ricegrass), and 95% (four-wing saltbush). With this kind of severe use, the vegetation may take decades to recover, if it does at all (West et. al. 1984). These examples indicate that at least in some cases existing range condition is being degraded within Glen Canyon NRA, and that better control of actual utilization values is necessary. Riparian zones are often also heavily utilized. However, the most severe damage in these zones is often on adjacent benches where forage is available. For example, grazing occurred in Davis Gulch in the Soda Allotment in the winter and spring of 1995-96. Utilization of Indian ricegrass on some benches was as high as 95%, with the mean at 82% overall. Utilization on four-wing saltbush was also severe at 78%. Many plants of all ages had been killed or severely damaged. Only about 10% of ricegrass plants showed any current spring growth (NPS

perched aquifer, are prominent around Lake Powell and in side canyons. The largest and best-developed alcove gardens in the world occur within the recreation area. These unique communities support many rare and endemic plant species. Another interesting and scientifically important community that may have been more widespread prior to the formation of Lake Powell is the mixed deciduous woodland, which occurs in shaded and well-watered side canyons. Extensive wetland and riparian communities are also found in side canyons with permanent streams and springs. Above the canyons, large tracts of desert shrubland, grassland, and piñon-juniper woodland occur. A total of 780 species are currently known from Glen Canyon NRA. Three of these are federally listed, Pediocactus bradyi, Carex specuicola, and Cycladenia jonesii. In addition, numerous other rare special status species are known.

Currently, relatively little is known about the status and trend of vegetation that is subject to livestock grazing in Glen Canyon NRA. The BLM maintains and surveys trend plots on and adjacent to recreation area lands as part of their general monitoring program on BLM lands. Ecological trend and status data is available for some but not all grazed areas of Glen Canyon NRA.

Resource Goal and Objectives

Goal: Maintain naturally diverse plant communities and species populations similar to Potential Natural Community composition. These include a full complement of native species, plant health and vigor, natural structure for wildlife habitat, dynamic changes, reproductive success, and population genetic and evolutionary changes.

Objective 1: Maintain, in upland plant communities, as natural a community as possible, including the full range of native species, a viable seed bank, and minimal presence of increasing undesirable species.

Objective 2: Protect healthy populations of special status species, including federally listed threatened and endangered species, federal candidate C1 species, and state and NPS ranked rare and sensitive species.

Objective 3: Manage and protect scientifically important areas, including hanging gardens, relict areas, and Douglas fir stands to prevent grazing induced changes.

Objective 4: Protect wetlands, riparian zones, and spring and seep vegetation.

Environmental Impacts:

Alternative 1 – Proposed Action

would be necessary in some instances. Under this action, upland and riparian vegetation would begin to improve because of lower utilization levels in critical periods of growth and reproduction. With lower utilization levels in spring, reproduction would increase and improve native seed banks. Soil loss due to accelerated erosion would decline because of healthier vegetation cover. Riparian zones would maintain healthy stream banks and vegetation cover, limiting erosional losses and flooding effects. Areas where ecological trend is either downward or static should stabilize and begin to improve. Special status species and sensitive plant communities would be protected from adverse impacts. It is anticipated that declines in the abundance of some exotic and weedy plant species would occur, particularly those species such as Snakeweed, Red Brome, Cheatgrass, Russian Thistle Russian Knapweed, and Cocklebur that are generally favored by grazing. Vegetation communities in most areas should gradually return to compositions similar to potential natural community compositions.

It is understood that other impacts occur to the vegetation of Glen Canyon NRA, including drought and recreational activity. These impacts will not be analyzed in this section. However, it is recognized that impacts of recreational activity, such as accidental fires and trampling, as well as drought, can have substantial effects on vegetation in some areas. Also, in some cases changing seasons of use, reduction in allowable AUM's, or other management changes will not produce a return to potential natural vegetation.

Alternative 2 - No action.

Without the guidance of the goals and objectives set forth in the grazing plan, grazing management in Glen Canyon NRA would continue to be reactive, and continue to suffer from ad hoc decisions because of different management by the various BLM Resource Areas. Under this action occasional high utilization of upland and riparian key species would continue. This would result in continued downward trend in some areas, and the lack of improvement in other areas where trend is static. Because of longer spring season grazing periods, reproduction would be reduced in key species. Native seed banks would remain depleted in some areas. Riparian zones would continue to suffer damage from trampling and browsing, reducing vegetation cover and causing increased erosion in impacted areas. Springs and other sensitive plant communities would continue to be damaged by grazing and trampling, potentially threatening the status of rare plant species at some sites. Exotic plant populations would continue to exist under disturbed conditions, particularly those that thrive with livestock grazing, such as Russian Thistle, Russian Knapweed, Cheatgrass, Red Brome, and Cocklebur.

Alternative 3 - Adopt BLM standards and guidelines (S&G's).

Under this alternative impacts to resources would generally be similar to the proposed action. BLM S&G's for vegetation are very similar to the proposed action objectives. The principal difference is in

natural resources, native plant communities will be managed for in the Glen Canyon NRA.

Some confusion may occur in the adoption of the BLM S&G's because of differences in interpretation of S&G's and methodology by Arizona and Utah State offices. The implementation of the S&G's also differs between the Arizona and Utah BLM offices. There are also no detailed monitoring objectives in the BLM S&G's regarding amounts of cover or species composition in upland sites. Particularly important is that there are no defined methods or objectives for the condition of riparian zone vegetation, the amount of damage and trampling allowed in riparian zones, or the kind of vegetation (native vs. exotic) necessary to prevent streambank erosion. These would be solved under the proposed action alternative, implementation of the grazing management plan as the same set of NPS goals and objectives would be applied throughout the Glen Canyon NRA.

Alternative 4 - Immediate compliance

This alternative would halt grazing in the short term in many areas until data could be collected to assess range condition and impacts to wildlife and water quality against the goals and objectives of the Grazing Management Plan. In order to reach the desired goals and objectives, changes in grazing management would be necessary in many instances. These could include changes in seasons of use, changes in allowable AUM's, construction of new range improvements, construction of additional fences, and other options. These alternatives would likely cause considerable economic hardship to many permittees, and overall negatively impact many livestock operations. Some impacts to native vegetation would occur where range improvements will be constructed, including removal and damage around new stock ponds and along fence lines. Additional impacts to vegetation would occur with livestock grazing in association with these new developments.

Cumulative Impacts: Long-term impacts may include limited loss of vegetation cover or declines of particular long-lived species associated with new developments. Under all alternatives except Alt. 2, No Action, there should be a gradual improvement in native seedbanks and plant reproduction, improved vegetation cover and native plant composition, a recovery of and enhancement of spring and riparian systems, and declines in some exotic plant species.

SOILS/TOPOGRAPHY

Values Statement

The values statement for this resource is "the evolutionary and ecological processes of the soil (abiotic) ecosystem, which include surface cover, microbial populations, soil nutrient cycling and physical/chemical transformations are critical to the protection of scientific processes and the scenic values within Glen Canyon NRA."

or water over time, and is composed of grains of silicate minerals cemented together by other minerals (principally calcite and iron oxide). Each layer is a "bed" or "stratum," usually formed horizontally, which represents a period of sediment deposition. Burial of older sediment beds brought about by fluctuating sea levels produced a stratum of rock that slowly changed to stone of various types. Sandstones (cemented sand) were derived from sandy materials; fine materials became siltstone (cemented silt) or mudstone (cemented mud), and the clay particles became shale (cemented clay). The geologic processes that helped to form the Colorado Plateau continue to influence the area and rock formations that denote the plateau as one of the most scenic areas in the world.

The main geologic units within Glen Canyon NRA are generally composed of the following: Mancos Shale, Dakota, Entrada, Navajo and Wingate sandstones, and the Carmel, Morrison, Moenave, Chinle, and Kayenta Formations. These "units" are generally considered to be contained within the San Rafael or Glen Canyon Groups. The soils that are derived from the above parent materials will have chemical and structural properties unique to the particular parent material, and thus soil composition will be similar within the region where the parent material resides.

The following landforms and associated soil units common to Glen Canyon NRA are:

Alluvial Flat	Glenton Soils Family - River Wash Complex
Dune Field	Sheppard and Nakai Soils
Benches	Bluechief, Monue and Nakai Soils (deep); and Moenkopie, Shipeta, Goblin, and Casmos Soils (shallow)
Intermediate Slopes	Myton and Chilton Soils
Cliffs	Rock outcrops and Badland Units

The different soil types (classifications) influence the type and quantity of vegetation found in an area. The erosion potential, nutrient availability, water holding capacity and physical structure of a soil are directly influenced by the parent material, while elevation, aspect, soil depth and degree of slope will influence the soil development processes. This is important to understanding what affects grazing will have on a particular vegetative community and the abiotic processes that occur there.

Soils within Glen Canyon NRA have not been extensively studied. However, there are many published articles on the characteristics of typical arid land soils. Generally, current conditions are typified by well drained, often shallow soils, with low soil organic matter percentage, and elements of organic carbon (C), nitrogen (N), phosphorous (P), sulfur (S), and potassium (K) tending to congregate near the soil surface (Skujins, 1991). Soils tend to be young, with poorly developed soil horizons. Soil structure is composed of wind blown fine to medium course sand, with a well-defined cemented zone, or caliche pan. This cemented layer is usually composed of compounds of calcium carbonate, gypsum, or silica. The depth of the pan varies with topography and soil porosity, however it is most common at relatively shallow depths.

perennial shrubs and small trees growing in this system utilize the open spaces to gather in nutrients and water. Though the open "space" appears devoid of all plant life, the underlying soil medium is blanketed by a maze of fine root hairs, thus creating a highly competitive environment that prevents many plant seedlings from becoming established. Soil fertility is also generally lower in the plateau than in areas with greater amounts of annual rainfall. Most nutrient accumulation takes place in symbiotic systems with bacteria or cyno-bacteria and lichens or "cryptobiotic" soils (Skujins 1991). These cryptobiotic covered areas are therefore important to plant nutrient availability. It would follow that disturbance to cryptobiotic populations could have a significant effect on the nitrogen cycle and N availability.

The percentage of soil nutrient cycling impacted by grazing activities within the recreation area is unknown at this time, as is the impact from other recreational activities. The trend plot data collected by the BLM over the past several years does not address the impacts of grazing on the soil system. Therefore, very little recent data is available on the "typical" soil conditions within Glen Canyon NRA. The main source of current information on soil types, structure, composition, etc., are from the Order 3 soil survey and soil mapping conducted in the early 1980's by the Bureau of Land Management and the Soil Conservation Service.

The general field overview of the current condition of the soils within Glen Canyon NRA indicates some high use areas being impacted by grazing activities, and to a lesser extent from unauthorized off-road vehicle use, and backcountry recreation. There are areas of relatively undisturbed canyon bottoms and inaccessible mesas which could be studied to compare perennial native plant litter and biomass production and cryptobiotic crust coverage under "no-grazing." These areas could then be compared to adjacent, grazed areas to begin to understand impacts from grazing livestock and wildlife on soils within the recreation area. It is generally accepted that greater soil disturbance, results in smaller areas of soil coverage by cryptobiotic crusts, and a reduction in desirable vegetative cover occurs under increasing grazing pressure in arid environments.

Therefore, it would follow that disturbance to cryptobiotic populations could have a major effect on the nitrogen cycle and N availability. In studies on denitrification, Mosier et al. (1981); Seligman et al. (1985); Feigenbaum et al. (1983); Sorenson and Fresquez (1985); Peterjohn and Schlesinger (1989) found that high levels of denitrification occurred where soils become compacted or sealed (Skujins 1991). Similarly, Penning deVries and Djiteye (1982) contend that there are no synergistic effects of livestock grazing, only a downward trend in soil nutrient pools in the long run.

However, moderate above ground herbivory may also enhance root feeding larvae of certain scarabeid beetles, which leads to the conclusion that grazing enhances rates of N cycling, with concentrations near the soil/air interface. It is also accepted that animals increase the rate of nutrient cycling. Seastedt (1985) noted that foliar herbivores, like cattle, may modify N distribution such that higher concentrations of N can be found in the roots, which then may encourage root

Resource Goal and Objectives

The soil resource goal is “to maintain the evolutionary and ecological processes of the soil ecosystem.”

To accomplish this goal, the following objectives were developed:

Objective 1: Characterize and understand soil erosion rates on various grazed and ungrazed plots (NPS).

Objective 2: Enhance soil productivity and nutrient cycling by limiting uses that contribute to the removal of plant litter, ground cover, cryptobiotic communities, and soil microorganism populations (NPS).

Note: Field data can be collected during routine trend plot monitoring or plant utilization studies, etc., or incorporated into other studies conducted by other resource disciplines.

Environmental Impacts

Alternative 1 – Proposed Action

For the proposed rangeland developments under this alternative, higher concentrations of animals may be detrimental to soil development processes. Heavy or intense, long-term grazing activity has a negative affect on soil productivity by altering soil horizon development and nutrient cycling. This is especially true in “sacrifice” areas, like those areas within a two-mile radius/distance from developed watering holes or tanks. These "sacrifice" areas also include corrals and the areas wherever livestock tend to congregate or trail repeatedly (fence lines). Soil compaction from trailing/trampling, or alterations of the surface horizon; will reduce the amount of cryptobiotic soil crusts, thus limiting nutrient cycling. The removal of a vital portion of the vegetative component in these areas can also be a factor in loss of soil productivity (reduced litter fall), and increased soil erosion.

Researchers have recognized that higher grazing levels contribute to deterioration of soil stability and porosity, cause an increase in erosion and soil compaction, and can remove beneficial soil litter which can improve the physical and biological aspects of the soil ecosystem (Westoby *et al.* 1989; and supported by works of Laycock and Friedel 1991). This alternative targets allotments in "poor" condition and "custodial" allotments, and changes management practices, which will help to reduce grazing impacts on this resource. Analysis of soils data collected from specific trend plots will assist the NPS in better understanding and characterizing existing soil condition and site productivity.

Favorable sites with deeper soils, better water holding capacities and less use are most likely to

It is understood that other outdoor recreation uses also negatively impact soil development and productivity. These recreational uses, like hiking, horseback riding, off-road vehicles, camping, etc., will not be analyzed in this section. However, the impacts to the backcountry soil resource from recreational uses are recognized as a contributing factor to long-term rangeland impacts.

Alternative 2: Impacts associated with the "no action" alternative will be similar to the proposed action except that under this alternative the impacts are expected to be greater. Impacts to soil productivity are expected to result from the longer spring grazing periods, which negatively affect certain species seed production and seedling viability. This in turn tends to reduce plant cover and litter deposition. As with all the proposed alternatives, there will be a loss in nutrient cycling potential due to trampling of the cryptobiotic soils, and some reduction in plant biomass production. Whenever rangeland developments are constructed, like watering holes, fence lines, and from development of roads (access/egress), etc., soil productivity is reduced. In the short-term, impacts to the soil resource would occur during construction activities. Long term impacts to soils will be caused from higher concentrations of livestock at these range developments. Trampling and removal of vegetation around new watering points and development of trails to forage areas is expected under all alternatives. There will also be long-term impacts to soils along fence lines, where the animals tend to trail.

The Bureau of Land Management recognized a need to change their existing grazing practices, and developed new grazing standards. Under this alternative, the new grazing S&G's would not be implemented. Therefore, this alternative is not acceptable, as it does not meet the NPS goals for preservation of natural resources or the new BLM grazing S&G's.

Alternative 3: Impacts associated with Alternative 3, to "implement new S&G's" would be similar to the proposed action, but there are differences in the monitoring requirements. The new grazing S&G's are an improvement over the past management practices, and are equal to the resource "Value Statements" of the proposed action (Alt.1).

The new BLM standard for Upland soils states " Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform." The BLM is to "Maintain sufficient residual vegetation and litter on both upland and riparian sites to protect the soil from wind and water erosion, and support ecological functions." This standard is very similar to the goal under the proposed action (Alternative 1), and meets NPS management criteria for this resource. However, there are no monitoring requirements proposed for this resource in the existing S&G's, and therefore this is not an acceptable alternative to the proposed action.

As with the other alternatives, short-term impacts are expected wherever rangeland developments are constructed (like stockponds, fences, and road development (access/egress, etc.). Soil productivity will be reduced, and impacts to the soil resource would occur during construction

objectives defined in the proposed NPS plan." The impacts on the soil resource would be greater if all permittees were required to begin construction of rangeland developments at one time. Impacts to the soil resource would occur in the short term from construction activities (water tanks, fence lines, road access/egress, etc.). Long term impacts to soils will be caused from trampling and removal of vegetation around new watering points and trails. Loss of soil productivity and reduction in nutrient cycling in areas of higher concentrated use will occur.

Cumulative Impacts: Long term impacts are expected to occur to crypto-biotic soils, mostly from trampling and periodic use of vegetation. This will reduce to a limited extent the soil productivity and nutrient cycling in the local areas of impact. Loss of topsoil from wind and water erosion is expected to continue in those areas impacted by heavier grazing use and pressure, mostly around range developments like watering holes, spring developments, riparian bottoms and fence lines and corrals, etc. Better management practices as proposed in all alternatives, except for ALT. 2, will benefit the rangeland in the long term. Once implemented, the revised grazing program is expected to result in greater soil cover values, reduced rates of soil erosion, and better overall soil ecosystem function.

WATER QUALITY

Value Statement

Glen Canyon NRA was established, "...to provide for public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto...and to protect and preserve the scenic, scientific and historic resources..." Water resources within Glen Canyon NRA are essential to support complex and diverse biological communities, riparian vegetation, fish and wildlife, which are often isolated by vast expanses of desert. Visitors come to enjoy water-related recreation at Lake Powell and intriguing hikes into remote canyons. Backcountry hikers rely upon local springs and seeps to supply drinking water, and enjoy the aesthetic value of natural free flowing water. Maintaining high water quality and instream flows are management priorities for sustainability of water and water-dependent resources.

Resource Condition

Park Service policy states that parks will seek to restore, maintain, or enhance the quality of all surface and ground waters within the park consistent with the Clean Water Act (33 USC 1251 et seq.) and other applicable federal, state, and local laws. Sewage treatment and disposal are subject to provisions of Executive Order 12088, "Federal Compliance with Pollution Control Standards" (42 USC 4321). Wetlands are nature's water quality enhancement tool. There is no specific national wetland law. Wetland management and protection results from many laws written for other purposes. Wetlands are managed under regulations related to land-use and water quality. The

The National Park Service Wetlands Protection Guidelines require the identification, mapping, protection, management, and restoration of wetlands in the parks. Park wetlands are protected from pollution through proper design of park facilities and by working with states to set the highest possible water quality standards. The amount of water needed to preserve wetlands in parks may be maintained through protection or acquisition of water rights.

The Colorado River Compact divided the seven states in the region into two basins. This compact is often referred to as “the law of the river” and currently does not meet the needs of the area because Indian water rights and ecological problems were not considered during compact writing. The ecological problems are many, silt build up behind the dam, sandbar deterioration below the dam, riparian habitat losses, and many more. Other US Codes include Title 43 Chapter 32 - Colorado River Basin Project, Title 16 Chapter 1 - Water Resources Projects, and the Wilderness Protection Act affect water quality.

Deserts are not necessarily characterized by great heat nor are they necessarily vast expanses of shifting sand dunes. The sole common characteristic of all deserts is their lack of water. “True” deserts result from a deficiency in the amount of precipitation received relative to water loss by evaporation. Glen Canyon NRA is located on the Colorado Plateau, an area often referred to as semiarid or steppe. Winter precipitation is light, chiefly in connection with frontal situations. Spring (April to June) runoff originates from snow pack high in the Rocky Mountains. This snowmelt runoff is the primary source of water (57% of the inflow) entering Lake Powell (Gloss et. al. 1981) via the major tributaries: the Colorado, Dirty Devil, San Juan, and Escalante Rivers. A fifth river in Glen Canyon NRA is the Paria River, which enters the Colorado River at Lee’s Ferry, 16 miles down-river from the dam. There are also several side canyon perennial streams flowing into Lake Powell. The principal ones are Hall’s Creek, Lake Canyon, and Last Chance Creek. A late summer-fall monsoon season, although contributing little water to Lake Powell, is a major water source for terrestrial vegetation. Other surface water resources include springs, seeps, rock pools, and intermittent streams or billabong systems. Lake Powell is the dominant water resource within Glen Canyon NRA, and is one of the nation's largest reservoirs. It is over 180 miles in length, and has over 1900 miles of shoreline.

One of the most important factors driving processes in the reservoir is inflow hydrology. Spring runoff is very low in salinity and warms as it courses through the canyon lands. This low-density water overrides the surface of the reservoir and reaches the dam later in the year. The greater the volume of snowmelt water greater the depth of water column mixing during the winter months. Winter inflow is colder and higher in salinity. This water plunges when it meets the reservoir. The density of the inflow will determines its position in the water column as the inflow water moves down lake. More information on the limnology of the reservoir can found in Hueftle and Vernieu (1998). For the most part narrow canyon reservoirs of the American Southwest are warm monomictic lakes

state agencies have responsibilities regarding the study and management of Lake Powell water quality, and are investing heavily in ecosystem monitoring and related investigations. These agencies are the National Park Service, Geological Survey (Water Resources Division and Biological Resources Division), Bureau of Reclamation, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, Utah Division of Environmental Quality, Utah Division of Wildlife Resources, Arizona Department of Environmental Quality, Arizona Game and Fish Department, and Navajo Nation Environmental Protection Agency.

The fishery at Lake Powell consists of a variety of warm water species (fact sheet, Fish species and distribution in Glen Canyon NRA 1997). Fish in Lake Powell have been stocked (NPS 1996). As of 1997 the State of Utah is no longer stocking Lake Powell. The States of Arizona and Utah, and the NPS regulate the lake for fishing.

The native fishery of the rivers, streams and tributaries consists of some sport fish such as trout. The majority of fish are now threatened or endangered. Although these fish have adapted to high-energy streams that vary in temperature from 60 to 68 degrees Fahrenheit and are very turbid in nature, some of the fish can survive in the lake. The importance of the lake inflow areas for brood rearing of Razorback Sucker and Colorado Squawfish has not been determined.

The non-native fishery below the Glen Canyon Dam consists of primarily rainbow trout. These fish were stocked (NPS 1996). The State of Arizona reports that the population is at 98% reproduction as of 1997. When the state planted these trout there was no native food base in the river. The state introduced Gammarus, an amphipod as an aquatic food source to kick-start the ecosystem for the trout. Since the water below the dam remains at a constant 46 degrees Fahrenheit, the trout are the only fish that can handle this thermal stress of a regulated system. The fishery below the dam is a world class trout fishery and there are special regulations that apply.

Little is known about the ecology in the side canyons of Lake Powell, or in other natural bodies of water such as waterpockets. Little baseline data exists on water quality and quantity for most water sources away from Lake Powell. Baron et al. (1998) studied the water chemistry and aquatic invertebrates of waterpockets in the Waterpocket Fold of Capitol Reef National Park, directly north of Glen Canyon NRA. However, their study focused on sites unaffected by livestock grazing. Some springs in the Glen Canyon NRA, such as those on the Kaiparowits Plateau, have been severely damaged by livestock trampling, with in some cases almost total elimination of riparian vegetation (NPS files).

Goals and Objectives

The goal is to "maintain water quality in all natural bodies of water and sources of water (does not include stock ponds or small reservoirs) and maintain natural flows to preserve water dependent

Objective 2: Bacteriological levels for fecal coliform in natural surface waters will not exceed standards for recreational use.

Objective 3: Preserve naturally occurring aquatic species diversity, composition and abundance.

Objective 4: Maintain integrity of stream morphology, instream flows, riparian zone, and springs' natural emergence.

Objective 5: Preserve the aesthetic value of natural water.

Objective 6: Ensure access to water sources for wildlife and recreational uses.

Environmental Impacts:

Alternative 1 - Proposed action

Implementing the Glen Canyon Grazing Management Plan is critical to maintaining the water quality of the Glen Canyon NRA. It is impossible to separate tributary conditions from watershed conditions. In that respect grazing on the Glen Canyon NRA has potentially large effects on erosion and thus sediment loads of tributaries. Overgrazing, by reducing plant cover, is linked with increases in erosion. The primary improvement would be in reducing suspended sediments in the tributaries and thereby improving the biodiversity of those tributaries. This improvement would result from increasing the depth of light penetration into the water, thus increasing periphyton production, and by reducing the siltation, thus increasing the number of interstitial spaces within the substrate for habitation by stream invertebrates. However, baseline data is currently lacking from most natural surface waters in Glen Canyon NRA away from Lake Powell, the Colorado River, and some springs. Another change would be in the reduction of direct impacts by livestock trampling in streams and springs and by maintaining healthy streambanks. The overall health of the adjacent riparian zone is critical to water chemistry and in reducing the level of suspended sediments.

Research at Glen Canyon NRA has shown that coliform bacteria from cattle can not be distinguished from coliform bacteria from humans with currently used bacterial monitoring test methods. Cattle feces contamination therefore confounds test results and can cause unnecessary beach closures. Limiting access of cattle to some beaches and drainages will allow the accurate assessment of dangers to public health. The Glen Canyon NRA's primary focus is protecting the water quality and public health at Lake Powell. The BLM has never monitored the water quality of Lake Powell, its tributaries, or other water sources away from the reservoir.

can also affect water quality. This Grazing Management Plan and the Environmental Assessment will focus only on the issue of grazing and its affect on natural processes and aquatic resources found within Glen Canyon NRA.

Alternative 2 - No action

Water quality depends on the condition of the watershed. The current condition of most watersheds (including vegetation, litter, soil) and a majority of riparian and spring water sources is unknown, and without proper studies an ad hoc or reactive approach to management could continue to be detrimental to water quality. Aquatic communities would continue to be impacted by trampling and sedimentation. High coliform counts on Lake Powell could continue to result from livestock inputs rather than recreational inputs, potentially adding to the closure of beaches.

Alternative 3 - Adopt BLM standards and guidelines

The Bureau of Land Management Guidelines for Grazing Management lack specific management objectives. It appears that the guidelines could provide the same level of resource protection as the Glen Canyon NRA Grazing Management Plan, however there are few defined objectives or monitoring methods available. Water quality goals would be the same under this alternative. However, the Proper Functioning Condition assessments used to assess riparian zone health are somewhat subjective, and strongly depend on the knowledge and background of the specialists doing the assessments. Thus, having the same goals will not necessarily produce the same results. There are no provisions for collecting aquatic invertebrate and vertebrate community baseline data in order to establish monitoring goals and to determine if water sources are meeting the S&G's for water quality.

Alternative 4 - Immediate compliance with plan.

This alternative would halt grazing in the short term in many areas until data could be collected to assess water quality and aquatic communities in natural surface waters, and compare the data against the goals and objectives of the Grazing Management Plan. In order to reach the desired goals and objectives, changes in grazing management may be necessary in many instances. These could include changes in seasons of use, changes in allowable AUM's, construction of new range improvements, construction of additional fences, and other options. These alternatives would likely cause considerable economic hardship to many permittees, and overall negatively impact many livestock operations. Impacts to natural surface waters and associated aquatic communities would likely be reduced under this alternative, as riparian zones and springs would need to be protected, and these livestock water sources replaced by the construction of new developments.

Cumulative Impacts: The long-term impacts of all alternatives except Alt. 2, No Action, would result in

water sources for livestock should have few if any long-term negative impacts on the water resources of the NRA.

WILDLIFE

Value Statement

The terrestrial and aquatic wildlife resources of Glen Canyon NRA are an integral part of the desert ecosystem to be experienced and enjoyed by visitors to the recreation area. These wildlife resources, which the National Park Service (NPS) is charged to protect and preserve for the enjoyment of future generations, have intrinsic and scientific value.

Resource Condition

Glen Canyon NRA supports a wide variety of wildlife, including federally threatened and endangered species. Currently, 285 species of birds have been recorded in the Glen Canyon NRA. Although less well studied compared to birds, mammals, reptiles and amphibians are also diverse. About 35 species of reptiles and amphibians and 75 species of mammals are reported. Little is known about invertebrates of the Glen Canyon NRA, especially in upland (desert) areas. Currently, surveys for aquatic invertebrates in springs and hanging gardens are being conducted to provide baseline data.

Glen Canyon NRA supports 10 species of special status wildlife, which includes federally threatened and endangered species and state listed candidate species: Peregrine Falcon, Spotted Owl, Southwestern Willow Flycatcher, Bald Eagle, Colorado Squawfish, Humpback Chub, Bonytail Chub, Razorback Sucker, Flannelmouth Sucker, and Northern Leopard Frog.

With the creation of the Glen Canyon Dam and Lake Powell much of the diversity and composition of the wildlife community in the area has changed. These changes have brought about displacements of some groups (small mammals, reptiles and amphibians) with the rising of the water level, but at the same time has created an influx of new species (waterfowl) and an increase in the population of peregrine falcons.

With about 880,000 acres of the recreation area used for grazing, concerns about potential impacts on wildlife and their habitats increase due to the many unknown variables at work within the ecosystem. Livestock grazing on rangelands exerts a controlling influence on plant community composition and structure, primarily as a result of selective defoliation of forage species. Similarly, it can be assumed that grazing induced alterations in the habitat could be reflected by changes in the distribution of resident animal species. An understanding of the differential and direct effects of domestic animals on plant communities is, therefore, of value in interpreting the indirect effects of livestock on native animal communities (Bich 1989).

persistent, unregulated hunting. The most important factors currently for decreases in bighorn numbers are degradation of range by domestic livestock, introduction of diseases by livestock, lack of available water at critical times, and disturbances during lambing times.

Beginning in the 1970's, efforts were made to move sheep from areas with a surplus, to areas that lacked of sheep or whose populations needed supplementation. The Arizona Game and Fish Department and the Utah Division of Wildlife Resources in cooperation with the Bureau of Land Management and the National Park Service conducted these efforts. As a result, bighorn herds of varying sizes presently roam the Escalante, the Kaiparowits, the North San Juan, the South San Juan, and the Paria Wilderness Areas. The bighorn sheep restoration effort continues with the cooperative agreements made between the various agencies. Nevertheless, disease issues, habitat concerns, and competition for agency dollars are some of the hurdles still being faced.

Effects of grazing on birds, reptiles and amphibians, mammals, and invertebrates are not well known on the Colorado Plateau or in Glen Canyon NRA. Willey (1994) studied impacts of grazing on arid grassland bird communities at Capitol Reef National Park. His study showed that some bird species were affected through changes in plant species composition and structure. Bich et al. (1995) documented changes in rodent species composition between lightly and heavily grazed sites. No work has been done on reptile and insect communities on the Plateau. Studies from adjacent arid regions are often ambiguous and contradictory with respect to impacts. Grasshoppers can be abundant on grazed sites, but other studies show greater abundance and diversity on ungrazed sites (e.g., Quinn and Walgenbach 1990; Welch et al. 1991). Lizard communities have also been shown to respond to grazing, primarily through alteration of species composition and foraging guilds (Jones 1981).

Grazing can affect the abundance and availability of small mammals (Shulz and Leininger 1991, Bock and Bock 1993). Rabbits depend on cover to protect them from eagles and four-wing saltbush (Atriplex canescens) has been identified as important cover for cottontails. It is not known which plant species are of dietary importance to all the small mammals (antelope ground squirrel, pocket mice, kangaroo rat, etc.) coexisting within the arid and semi-arid ecosystems of the Glen Canyon NRA. Nevertheless, what is known is that where the vegetation has been heavily grazed, there is less small mammal abundance and species diversity being supported by the habitat. This is due to the limiting factors of food availability and cover. With the absence of these animals as prey species, there will also be an absence of the predators that depend on them, thus creating an imbalance in the ecosystem. Rosentock (1996) noted some differences between grazed and grazed areas at Capitol Reef National Park. Rodents were more diverse and more abundant in ungrazed sites compared with nearby similar grazed sites.

Mule deer are year round residents on most of Glen Canyon NRA, especially in the canyons. Some critical winter range occurs in Imperial and Bull Valleys. The BLM has recognized the importance of

to excessive heat and loss of moisture without the shading effect provided by adequate vegetation. Livestock eating and trampling riparian vegetation growing on their banks, thus increasing erosion and sedimentation within them also potentially imperils water sources used by wildlife and those being occupied by fish within the desert ecosystem. The Great Basin Spadefoot Toad is one of the species that may be affected by erosion and sedimentation in water sources in the desert. These animals are opportunistic breeders, using ephemeral pools that are formed after a rain shower for laying their eggs. The development of these eggs is dependent upon water not choked by sedimentation runoff from eroding banks. As mentioned earlier, these pools, tinajas, and potholes are of critical importance to the wildlife supported in the area and can be a major limiting factor in the life cycle of species like bighorn sheep.

Goals and Objectives

Goal: Maintain components and processes of natural ecosystems, including the natural abundance, diversity and ecological integrity of the wildlife and fish.

Objective 1: Protect State and Federally listed threatened and endangered species, species of special concern, and critical or required habitat.

Objective 2: Minimize the competition between livestock and wildlife.

Objective 3: Maintain the natural abundance and diversity of avifauna.

Objective 4: Maintain the natural abundance and diversity of mammals.

Objective 5: Maintain the natural abundance and diversity of herpetofauna.

Objective 6: Maintain the natural abundance and diversity of invertebrates.

Objective 7: General predator control activities will not be permitted.

Objective 8: Protect aquatic species, including federally listed fish (see Water Resources).

Objective 9: Feral or trespass animals will be removed.

Environmental Impacts:

Alternative 1 - Proposed action.

Under the proposed action, data about the abundance and diversity of wildlife, and specific habitat

associated resources and eliminating possible vectors of disease transmission to native wildlife. These actions will require continued monitoring to insure that goals are being met, and that livestock grazing is not causing declines in native species. In the event that studies determine that livestock grazing is having either a direct or indirect negative impact on populations of native species, one or more actions may be taken. These may include changes in forage allocation to increase resources for native species, re-distribution of water sources, changes in pasture rotation or seasons of use, and construction of new fences.

Alternative 2 - No action.

We know very little about the ecology and status of most wildlife in Glen Canyon NRA. In the absence of baseline data, we do not know if current grazing management is causing declines in some native wildlife populations. Studies elsewhere, however, have linked grazing to declines in some species. Under this alternative the NPS and BLM would continue to operate without baseline information that is necessary to properly understand and mitigate the impacts of livestock grazing on native wildlife. These impacts can range from minor changes in population size to severe declines or even local extirpation. Of particular concern is that under current management practices, there is no forage allocated to wildlife in some allotments. The impact of this on native animal populations is unknown but is likely to be detrimental.

Alternative 3 - Adopt BLM standards and guidelines (S&G's).

This alternative is similar in many respects to the proposed alternative. However, there are some differences in management goals between the Glen Canyon NRA Grazing Management Plan and the BLM S&G's. There are no specific goals for maintaining wildlife communities other than "maintain desired native species", including threatened and endangered species. Desired species could in certain instances under this alternative be non-natives, such as Chukar, Wild Turkey, or wild horses. These are currently considered undesirable exotic species in Glen Canyon NRA. Another difference is that the BLM S&G have included provisions for the use of non-native plants in some cases. The introduction of these non-natives have unknown but potentially serious consequences for native wildlife.

Alternative 4 - Immediate compliance with plan.

This alternative would halt grazing in the short term in many areas until data could be collected to determine the status of native wildlife populations as well as their habitat requirements. In order to reach the desired goals and objectives, changes in grazing management may be necessary in many instances. These could include changes in seasons of use, changes in allowable AUM's, increases in forage allocation to wildlife, construction of new range improvements, construction of additional fences, and other options. These alternatives would likely cause considerable economic hardship to

Cumulative Impacts: Long-term impacts under all alternatives except Alt. 2, No Action, will include a better understanding of the wildlife communities and particular wildlife species, the affects of grazing on wildlife and resource base, and improved management of wildlife through a better understanding of forage utilization. Changes in management practices including changes in forage allocation, seasons or rotation patterns should in the long-term benefit the native wildlife of Glen Canyon NRA. Implementation of the proposed alternative would provide protection for desert bighorn from disease transmission, and enhance the habitats and protect populations of aquatic wildlife.

CULTURAL RESOURCES

Value Statement

"Cultural resource properties are irreplaceable and non-renewable resources with scientific, cultural, educational, and interpretive value." This value statement is reflected in the management directives contained in National Park Service Management Policies, NPS 28 (1988). These policies prohibit any actions which might result in unmitigated site destruction: "The National Park Service will not take or allow any action that reduces the research potential of cultural resources without an appropriate level of research and documented data recovery." It further requires that, "Any action that will affect cultural resources adversely will be undertaken only if the following additional criteria are also met: 1) There is no reasonable alternative; 2) All reasonable measures to limit adverse effect will be taken, including recovery of data and salvage of materials, as appropriate."

Resource Condition

Nearly 2300 cultural resource sites have been recorded within the boundaries of Glen Canyon NRA, most of which date to the prehistoric period. Much of the survey work was completed prior to the filling of Lake Powell. Since that time, about 2 percent of the 1.2 million acres within the recreation area have been intensively surveyed. Assuming an average 14 sites per square mile, potentially over 19,000 sites have not yet been identified and recorded on the 882,500 acres open to grazing.

During the pre-inundation studies of the late 1950s, the University of Utah and Museum of Northern Arizona recorded approximately 900 of the 2300 total sites. The remaining 1400 sites have been recorded during surveys and studies conducted since that time.

It is estimated that approximately 60 percent of the 900 sites recorded during the pre-inundation studies (about 550 sites) were destroyed by the rising waters of Lake Powell, leaving about 350 of those sites still in existence today. With the addition of the 1400 sites recorded after the pre-inundation work, approximately 1750 sites remain in the present site pool of recorded sites.

The majority of the prehistoric sites recorded within Glen Canyon date to the Pre-Formative and

In Glen Canyon NRA, five general site type categories are recognized. These include alcove sites, open surface sites, historic sites, rock art sites, and Traditional Cultural Properties.

Alcove sites are generally located in concave recesses in the sides or heads of steep-walled canyons, and can occur as well under tilted talus boulders, and in overhanging cliff faces, crevices, and shallow concave holes in the canyon walls. Specialized types of alcoves include rockshelters and caves, with varying degrees of protection from the elements. Alcove sites often contain both above-ground and subterranean structural remains, and they can accommodate other archaeological features as well including but not limited to storage cists, granaries, rock alignments, hearths, rock art, and middens (prehistoric trash dumps), along with associated artifacts and perishable materials.

Open surface sites are characterized by their lack of any natural shelter such as overhanging cliff faces or ledges. They contain the same kinds of archaeological features described for alcove sites, and may show evidence of agricultural features as well.

Historic sites must be at least 50 years old and contain cultural material deposited after 1540, the year the Spanish entered the area for the first time. Types of historic sites within the recreation area include those related to mining, ranching, pioneering, and recreational activities as well as Native American use of the land. Features found at historic sites include many objects related to the history of grazing and its way of life as well as other activities such as structures, corrals, dumps, trails, roads, inscriptions, boats, and historic paraphernalia such as tin cans, glass, china, metal, and milled wood. Historic sites are located in alcoves as well as on open surfaces.

Rock art is a specialized feature that occurs in alcoves, on vertical cliff faces, and on boulders. Both prehistoric pictographs (painted elements) and petroglyphs (pecked elements) are known to exist in the recreation area. Historic inscriptions, along with Navajo and other Native American rock drawings, are considered rock art as well. Rock art becomes a site type category only when it is the only feature present at a given location. When rock art is associated with other prehistoric and/or historic features, then it is a feature within one of the other three site type categories.

Traditional Cultural Properties include those locations associated with the cultural practices or beliefs of a living community, rooted in the community's history and are important in maintaining the continuing cultural identity of the community.

Grazing has been an activity within Glen Canyon NRA since the area was first settled in the late 1880s. Cultural resources, particularly prehistoric sites, have been impacted since that time. Areas greater than 2 miles distant from water were at first spared intensive impacts, 2 miles being the average daily range of livestock from their water source in cool weather. As rangeland waters have been increasingly developed over the years however, areas of impact have increased.

(e.g., along fences, near water sources, in alcoves, and under large shade trees). Such structures form a critical part of the archeological record, providing information on construction techniques, seasonal subsistence activities, social organization, occupational sequences and cultural affiliation. Subterranean and semi-subterranean structures are not as susceptible as above ground structures, although they can be totally obscured if ground contours are lost through churning and stirring of soil deposits.

Several studies (e.g., Osborn et al. 1993) have shown that features such as artifact concentrations and caches are extremely susceptible to dispersal and destruction as a result of trampling. Individual artifacts are broken and damaged, while the overall visibility of scatters is reduced through downward displacement of individual artifacts into the soil, and horizontal dispersal across and below the surface. Critical information regarding activity areas, internal site organization, seasonality, artifact technology and site function is lost as a result of these impacts.

Constructed features such as hearths, rubble mounds, milling bins, storage cists, granaries, and rock alignments are also easily lost or destroyed by grazing livestock. Most typically, construction elements are dislodged and dispersed by animals walking through site areas or "bedding down" on or near the features. Critical information on site function and diversity is lost as a result.

Even if no obvious structures or features exist at a site, livestock trailing across midden concentrations can cause severe impacts. Middens are prehistoric trash dumps, and can provide important, and sometimes the only, information concerning subsistence, material culture, and even burial practices. If they have great depth, the stratified deposits of a midden can provide information about the length of occupation of the site and even the season during which it was occupied. Trails across natural site contours quickly develop into erosional gullies that headcut into stratified deposits. The turning and heavy pawing that occurs as part of the bedding down process in midden areas results in churning of these deposits to a depth of up to 30 cm or more in some places. Valuable deposits containing perishable baskets and sandals, as well as vegetal and organic remains are often completely destroyed as a result. The opposite effect, compaction, can also occur, resulting in the distortion of the vertical and horizontal distribution of materials.

Unlike the features associated with alcove, open surface, and historic site types, which are generally located on horizontal ground surfaces, rock art sites are more often located on vertical cliff faces, alcove walls, or boulder surfaces. In some cases, rock art elements are executed high on a given surface, out of reach of livestock damage. However, many panels are located lower on a vertical surface, and these panels can be heavily abraded and eroded by cattle rubbing up against the cliff face. Secondary impacts to rock art panels include the desire by individuals to inscribe their own names on cliff faces and alcove walls, often impacting 1000 year old petroglyphs or pictographs.

Cultural resource damage caused by livestock is well documented. Of the 130 sites regularly

items, hearths, ceramics, and macrobotanical remains are actually torn up or churned by livestock.

Present grazing practices tend to concentrate livestock in riparian canyon bottoms where there is lush vegetation and a continual water supply. These areas have also been utilized by human groups for thousands of years and contain some of the richest archeological deposits in this nation. Current condition of sites in the canyon bottoms varies, depending, most importantly, on whether or not the site is accessible to livestock. This is generally a "micro-topographic" variable, highly dependent on the specific configuration of the terrain around the site.

Three riparian canyon systems have been partially surveyed in recent years by Northern Arizona University (Geib et al. 1987; Geib 1994). Comparative information on grazing impacts extracted from sites within these canyons show that livestock trampling effects between 9 and 43 percent of the sites. Fifty-two percent of all of the impacted sites were either permanent or seasonal habitation sites, containing perhaps the most significant archeological data. This represents approximately 12 percent of the total site population recorded for these three canyons (124 sites). Eighty-nine percent of the impacted sites had structures, artifact concentrations, hearths, or other features such as cists and granaries that are highly vulnerable to grazing impacts. The most heavily impacted of the three canyons has been closed to grazing for over thirty years, but has been continuously used since that time by feral horses and trespass livestock.

Information from other areas indicates even higher levels of grazing impacts. Survey data from the Andy Miller Flats/Red Benches area near Hite (Geib and Bremer 1988) show that livestock grazing has impacted 86 percent of the 69 recorded prehistoric sites (Geib and Bremer 1988:220). These include not only rockshelter habitation sites, but also open and special activity campsites located in sandy dune areas. Hearths and other fragile work areas have been damaged by stock trails, which in turn have caused active erosion. Only 8 percent of the 69 sites were in excellent condition (virtually undisturbed). Sixty three percent were in good condition (25 percent or less disturbed), and 29 percent were in fair to poor condition (more than 25 percent disturbed).

Intensive surveys of selected parcels in the benchlands above Wahweap and Warm Creeks revealed a similar pattern of livestock damage (Geib 1989:51). Grand Bench revealed the highest concentration of prehistoric sites in the study area (up to 68 sites per section), and of these, 44 percent (Geib, personal communication) showed significant evidence of damage by livestock. These sites were located primarily in open settings. Shallow alcove sites received the most intensive impact because trampling not only damaged the cultural materials but also increased on-site erosion.

The impact of range management practices was also noted during the survey (Geib 1989). Sites were in noticeably worse condition in the northern portion of Grand Bench, near a developed spring that served to concentrate livestock in that area. Several instances of direct impacts to sites caused by fence-line and spring development were recorded. In one instance a deeply stratified midden was

individuals in the field. This is especially true of sites in the archaeologically rich tributary canyons of the Escalante River, many of which suffered extensive damage during early ranching activities there. Digging in stratified middens is especially common in areas throughout the recreation area that have a long grazing history.

In general, grazing does not impact historic sites as heavily as prehistoric sites. The primary reason for this is that the pattern of livestock concentration doesn't always coincide with the location of historic sites the way it often does with prehistoric sites. Historic activities have generally not been centered in the grassland and riparian environments, with arable soils and abundant rockshelters, that were so attractive to prehistoric occupants and currently act as "magnets" for livestock. Another reason is that historic occupation of the area has been ongoing for a much shorter period of time than prehistoric occupation, so that quantitatively there are far fewer historic remains.

Since most historic sites in the park date to this century, their condition is, for the most part, fairly good. Although information is not available for more than a few historic sites, the primary impacting agents are apparently weathering and erosion. Where livestock do come in contact with historic structures, features, and artifact scatters, however, their impacts are extremely destructive. Buildings are toppled, features are broken and scattered, and objects are buried and dispersed.

Resource Goal and Objectives

Goal: Preserve and protect the scientific value, and foster appreciation for, the cultural resources and their settings within Glen Canyon NRA. This protection and preservation extends to both prehistoric and historic cultural resources as well as Traditional Cultural Properties.

Objectives: The general objective of this goal calls for no adverse effects on prehistoric or historic properties resulting from grazing activities on park lands without appropriate mitigative actions and completion of consultation with the State Historic Preservation Officer as required under Section 106 of the National Historic Preservation Act. Following are more specific objectives for each of the site type categories recognized in Glen Canyon NRA.

Objective 1: Protect cultural resources within the Primary and Secondary AOI.

Objective 2: All alcove sites identified within the Primary and Secondary AOI will be protected from damage or loss due to livestock grazing activities.

Objective 3: All open surface site identified within the Primary and Secondary AOI will be protected from damage or loss due to livestock grazing activities.

Objective 4: All historic sites identified within the Primary and Secondary AOI will be protected

includes the curation of artifacts and other materials collected during mitigation efforts.

Objective 7: American Indian traditional, cultural, or ceremonial sites identified within the Primary and Secondary AOI will be protected from damage or loss due to livestock grazing activities.

Environmental Impacts:

Alternative 1 - Proposed Action

Under the Proposed Action Alternative, adverse effects on prehistoric, historic, or traditional cultural properties resulting from ground disturbing activities associated with any new grazing proposals, or changes in current grazing practices, will be identified and mitigated. Sites will be located within the Primary and, if necessary, the Secondary AOI, through literature searches and intensive field surveys. Condition assessments and site documentation will be conducted. Where possible, grazing-related impacts to cultural resources will be mitigated through fencing or other methods of avoidance. Monitoring will be required to ensure that protective measures remain in place and are effective. In cases where avoidance is not an option, data recovery will be required. All data recovery activities including surface collecting and ground disturbing activities will be carried out under the Secretary of the Interior's Standards and in consultation with the appropriate State Historic Preservation Officer and affiliated Native American tribal representatives. Glen Canyon NRA will accomplish the requirements of Section 106 of the National Historic Preservation Act that adverse effects on cultural resources to be mitigated.

Alternative 2 - No Action

Under the No Action Alternative, adverse effects on prehistoric, historic, or traditional cultural properties resulting from ground disturbing activities related to livestock grazing will continue to be dealt with on a case by case basis. The focus will continue to be on the area of ground disturbance only. As a result, under this alternative, sites within the Secondary AOI may continue to degrade. Glen Canyon NRA will not accomplish its' responsibilities to mitigate adverse effects as required under Section 106 of the National Historic Preservation Act.

Alternative 3 - Adopt BLM Standards and Guidelines

The purpose of the Utah Standards and Guidelines are to maintain functioning ecosystems and they do not address cultural resources. The Arizona Standards and Guidelines reference cultural resources in Guideline 3-7; "Management practices to achieve desired plant communities will consider protection and conservation of known cultural resources, including historical sites, and prehistoric sites and plants of significance to Native American peoples."

Alternative 4 - Immediate Compliance:

Under the Immediate Compliance Alternative, all ground disturbing activities related to livestock grazing would cease until a full assessment of adverse effects on prehistoric, historic, and traditional cultural properties could be accomplished and mitigative measures taken. As in the Proposed Action Alternative, the identification, documentation, condition assessment, and avoidance and/or mitigation of prehistoric, historic, and traditional cultural sites in both the Primary and Secondary AOI would be necessary to ensure no adverse effect resulting from grazing activities.

Cumulative Impacts: The identification of sites and the implementation of mitigation measures where grazing continues to disturb eligible properties will be required under Alternatives 1 and 4. Identifying and mitigating adverse effects will help ensure that the NPS complies with its responsibilities under Section 106 and 110 of National Historic Preservation Act. Under Alternatives 2 and 3, there will continue to be short- and long-term impacts to cultural resources. Some of these impacts include degradation to surface deposits, trampling of and around prehistoric habitation sites (like remote alcoves and springs), and degradation of historic structures.

PALEONTOLOGICAL AND QUATERNARY RESOURCES

Value Statement

"Dinosaur trackways found in the Morrison formation, shark teeth in the Mancos Shale, and Quaternary Period resources including packrat middens and preserved faunal and floral remains are irreplaceable scientific resources."

Existing Conditions

Paleontological and Quaternary resources are found throughout the recreation area. The extent of these resources is unknown. These irreplaceable scientific resources include dinosaur trackways found in numerous formations, shark teeth in the Mancos Shale, and widespread Quaternary Period resources including packrat middens and preserved faunal and floral remains. Loss of these resources and/or disturbance or loss of site integrity without complete data recovery would not meet the requirement in the Glen Canyon NRA enabling legislation to protect scientific objects in the recreation area.

Limited reconnaissance level surveys have documented the presence of single tracks and trackways in the recreation area. The formations that contain these fossilized resources are exposed at many locations in the recreation area in widely scattered locations. Loss of existing paleontological resources has occurred due to erosion, inundation by Lake Powell, vandalism, illegal removal, and breakage. Existing range improvements may or may not have been surveyed for paleontological

settings that allow for accurate aging of deposits. Quaternary deposits have been identified in the Wahweap Creek drainage, the Escalante River drainage and the Orange Cliffs. These resources provide critical information and understanding of past environments and environmental change. Livestock activities at quaternary resource sites contribute to erosion, loss of provenience, churning of strata, mixing of present day large ungulate manure, hair etc., with quaternary remains.

Resource Goal and Objectives

Goal: Preserve paleontological and quaternary resources in-situ or insure full data recovery and curation of recovered specimens.

Objective 1: A literature search and first order survey to locate and record paleontological and quaternary resources will be completed prior to ground disturbing activities.

Objective 2: Paleontological and quaternary resources will be protected in-situ whenever possible. Removal will occur only when necessary to safeguard resources from impacts that cannot be administratively controlled. Excavation and removal will be fully documented and objects will become part of the recreation area museum collection.

Environmental Impacts:

Alternative 1 – Proposed Action

Under the proposed action no ground disturbing action will be authorized until a paleontological survey for trackways and Quaternary resources is completed within the immediate area of impact. Changes in grazing management practices that would potentially impact areas not presently grazed will require literature searches and ground surveys. As more Quaternary site data becomes available a predictive model will be developed that may reduce the extent of the area needing ground surveys. At the present time the recreation area does not possess the detailed geologic base maps for the entire 882,678 acres where grazing can occur so literature searches and ground surveys for these resources may be necessary.

Paleontological and Quaternary resources will be left in-situ whenever possible which may necessitate fencing or other mitigating actions. Denial of approval for ground disturbing activities will occur if mitigation actions or full data recovery cannot be accomplished. Paleontological and Quaternary resources that cannot be left in-situ will be curated and placed in the recreation area museum collection.

When identified paleontological and quaternary resources are left in-situ they will be monitored to insure that mitigation actions such as fencing or different management practices are effective in

immediate area of impact when ground-disturbing activities are proposed. When such resources are found in the area of impact then mitigation or excavation is required. Extensive surveys for Quaternary resources in secondary areas of impact or areas effected by proposed changes in grazing management practices are not surveyed. Mitigation, data recovery or denial of the proposed action does take place if paleontological or quaternary resources are known to exist in the area of impact.

Alternative 3 – Adopt BLM Standards and Guidelines

Paleontological and Quaternary resources are not addressed in the S&G's . Surveys or literature searches to determine the presence of these resources is not required. Protection of these resources in-situ or data recovery and curation is not required.

Alternative 4 - Immediate Compliance

Very few paleontological or quaternary surveys at existing range improvements or on active allotments have been done. Locations of all existing range improvements would have to be surveyed. Existing Quaternary site data is very limited, as few locations have been documented. Immediate compliance would call for extensive field surveys and create an unacceptable burden for permittees and agency staff.

Cumulative Impacts: Paleontological and quaternary resources are not well defined within the recreation area at this time, so some impact to surface resources is expected to occur on an infrequent and random basis. Where there are known surface resources, steps will be taken to protect them in those areas subject to grazing. Literature searches and field surveys will need to be conducted in the short-term to ensure that these resources are protected and documented for the future. Mitigation measures employed under Alternatives 1 and 4 will require a site inventory to be conducted within the areas of proposed construction or development. This will reduce potential impacts in the short-term, and help to ensure that these resources are protected over the long-term for the enjoyment of future generations.

SCENIC RESOURCES

Value Statement

Glen Canyon NRA contains magnificent scenic vistas. Deep canyons, sheer cliffs, distant mountain ranges, colorful soils and vegetation, and a unique collection of mesas, buttes, and spires all form a mosaic of visual enchantment for the visitor specifically identified for protection in the enabling legislation.

Resource Condition

Glen Canyon NRA contains some of the most magnificent scenic vistas of any Park Service unit. Deep canyons, sheer cliffs, distant mountain ranges, colorful soils and vegetation, and a unique collection of mesas, buttes, and spires all form a visual mosaic for the visitor.

The enabling legislation for Glen Canyon NRA specifically identifies scenic resources directing the NPS to preserve them. Scenic values are those elements of a landscape which contribute positively, both through the senses and the emotions, to the overall quality of a visitor's experience.

The General Management Plan for Glen Canyon NRA states that "management zones" will be the basis of managing park activities and protecting the resource. The two largest zones are the Natural Zone and the Recreation & Resource Utilization Zone. While grazing is specifically permitted in both of these zones, it is also clear that it must be in a manner "consistent with conserving the area's scenic, scientific, and cultural resources" (Statement for Management, 1991).

Visitor surveys have consistently shown that enjoying scenic vistas is one of the most important activities for them while visiting national park areas. (White, 1979; Machlis, et. al. 1988; Wood et. al., 1989;). At Glen Canyon NRA, viewing scenery is consistently rated as important, very important, or extremely important by both lakeshore and backcountry recreationists (Machlis, et. al., 1988; Wood, et. al., 1989).

Lakeshore and backcountry visitors most frequently cited impacts of cattle and grazing as evidence of non-recreational use within the recreation area (Machlis et. al. 1988; Wood et. al. 1989). Among backcountry users, the largest percentage of responders (34%) said these impacts had a very negative impact on their experience, with 14% stating a negative impact (Wood et.al. 1989). Additionally during the 1989 survey, backcountry visitors were asked to detail what their likes and dislikes were. The largest percentage of "likes" (16%) mentioned scenery and views. The largest percentage of "dislikes" (18%) mentioned cattle grazing. Other respondents listed "water polluted by cattle", insects associated with cow manure", and "multiple trails caused by cattle" (Wood et.al. 1989).

Of equal importance but extremely difficult to measure is the "affective bond between an individual and a place or setting" (White 1979). This bond, described by some as "topophilia" (Tuan 1974), literally a "love for a specific place," seems to be reflected in much of the popular outdoor literature today. Because the vast majority of Glen Canyon NRA lakeshore and backcountry users are returnees (Wallace et. al. 1994; Wood et. al. 1989, Machlis et. al. 1988), this intangible must also be factored into any aesthetic value system.

When attempting to define and/or quantify scenic values, a variety of issues must be considered. Such tangible elements as landforms, color, vegetation, uniqueness, and absence of development or modification are obvious and, to some degree, quantifiable criteria. Less quantifiable are those emotional

emotional expectations based on previous experiences.

A criterion to determine scenic value utilizes the Bureau of Land Management's Visual Resource Management Guidelines, National Park Service Guidelines and Policies, and the US Forest Service's Visual Assessment Program.

The following elements make up scenic values:

1. Landforms -- Topography; the Colorado Plateau is characteristically known for its varied and unique skyline of buttes, mesas, spires, arches, mountains, etc. Topography featuring high vertical relief, highly eroded landforms, rock outcrops, spires, and other interesting landforms has high scenic value. Large dune formations, eroded badlands, deep canyons, and the like would also rate highly. The degree to which these landforms dominate the view would determine, to some extent, the value of the view. Landforms with little or no relief, flat or with low rolling hills, and few remarkable details or interesting features would have lower scenic value.
2. Vegetation -- A variety of natural or native vegetation with an interesting relationship of form, pattern, and texture has high scenic value. Areas with less variety would tend to be rated lower. Areas of little or no vegetation may generally have lower value.
3. Water -- Where it is present, water that is clear and clean, either still or running, has high scenic value. Cascades, waterfalls, or other unusual circumstances, as well as the degree of dominance in the landscape would all affect the value. Seeps, springs, and any other perennial water would be considered in the overall value. Murky, muddy, or polluted water would lower the scenic value of an area. However, the mere absence of water or a water source would not be reason to lower the scenic value of an area.
4. Color -- The value of color includes combinations of rich colors or a smaller variety of especially vivid colors as well as pleasing contrasts in rock, soil, and vegetation. Colors might be dependent on time of day (e.g. sunrise or sunset). Extremely muted colors or generally monochromatic landscapes may have less scenic value.
5. Proximity -- What is in the immediate proximity? Adjacent scenery may enhance the view contributing to a higher value than if the adjacent area were neutral or detracting.
6. Uniqueness -- Is the view one of a kind? What are the opportunities for duplicating a scenic view such as this? Is the scenic view of a unique feature or combination of features. Value would also be enhanced if there were a unique opportunity for plant or wildlife viewing. The more "typical" a view is determined to be within its region, the lower the value.
7. Modification -- To what extent will an activity modify the scenic view from its natural state?

While large landforms are not directly affected by grazing impacts, viewsheds are impacted visually by the presence of cattle, roads related to grazing and stock trails. If numerous enough these break up the natural flow of the eye across the landscape, reminding the visitor that man has modified the natural scene. Vegetation utilization can reduce the amount and kind of vegetation, reducing the variety of texture, color and pattern therefor changing the naturalness even to the extent of introducing or creating a system that encourages alien species. Water sources are physically altered or water quantity and quality affected.

Existing recreation area inventories divide viewsheds into four categories:

1. Viewsheds from Signed or Designated Overlooks--These are scenic vistas from signed overlooks or pullouts that encourage visitors to stop and look. Because the scene is the attraction it is highly sensitive to modification.
2. Viewsheds from Existing and Proposed Marinas--These are views from established developed marina sites where congregations of visitors and developments encourage the viewing of scenery.
3. Viewsheds from Major Travel Routes along the Lake Surface and from Access Roads to Glen Canyon NRA--Scenic vistas seen from points along the lake or access roads are important to the visitor. They provide an integral part of the recreational experience both as an initial impression of the recreation area and as a part of boating or camping on or around Lake Powell.
4. Viewsheds from Backcountry Areas--This inventory, primarily vistas seen from backcountry roads and hiking routes, is incomplete. Though visited by a relatively small number of visitors, the main reason for getting to the backcountry is to experience pristine conditions, including unimpeded scenic views.

Environmental Impacts:

Alternative 1 – Proposed Action

Using the criteria developed to evaluate impacts to scenic resources proposed actions will be reviewed to determine whether impacts will be short term or long term. Mitigating requirements for structures associated with range improvements may require that they be located so they do not impact the view and may require that they be painted or constructed of materials that blend them into the background. Needed fences would be located below the horizon rather than on top of ridges, etc. Grazing management practices that enhance the natural vegetative community cover, diversity, and structure in important viewsheds may be required.

Alternative 2 – No Action

Alternative 3 – Adopt BLM Standards and Guidelines

Scenic values are not identified in the S&G's. The Utah Guidelines state that the quality of the outdoor recreation experience is to be considered. Aesthetic and scenic values are among those considerations. The protection and enhancement of scenic values is not given the same level of management emphasis as is required within the recreation area.

Alternative 4 – Immediate Compliance

Immediate compliance would require an on-site visit to all range improvements. Development and implementation of mitigation requirements for structures would be required where necessary. Surveys of existing fences and relocation if they are a visual intrusion would take place. Changes in grazing practices maybe necessary to enhance vegetative community cover, diversity and structure.

Cumulative Impacts: Long-term impacts are expected to occur in those areas where livestock tend to congregate, and around developed watering locations. There will be a reduction in vegetative cover and higher number of "cow pies" and trails, which may negatively impact some backcountry users. Changes to the vegetative cover may also impact scenic quality in the more highly used recreation "corridors," but this is expected to diminish over time as the grazing program evolves. With the implementation of mitigation measures and increased management of "problem" areas, the impacts will be reduced to an acceptable level. Cattle use in the Glen Canyon area has occurred for over 200 years and is a part of the scenic quality many visitors come to expect when they visit the western United States. Grazing is also authorized under the enabling legislation that created Glen Canyon NRA in 1972, and therefore continues to be an important aspect of the scenic quality of the area.

RECREATIONAL RESOURCES

Value Statement

Glen Canyon NRA was established ". . . in order to provide for public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto in the States of Arizona and Utah". Millions of visitors use the recreation area each year. There are over 2.3 million recreation overnights on the shores of Lake Powell and in the backcountry. Recreation use ranges from those activities that require solitude and an undisturbed setting to very mechanical recreation such as power boating and four-wheel driving. Recreation area management zoning has addressed these diverse activities.

Resource Condition

Lake Powell, 163,000 acres in size makes up only 13% Glen Canyon NRA. Visitors from around the world take day hikes from the lake and extended hikes into the backcountry from open roads.

opportunities to meet differing visitor expectations.

Some of the more popular backcountry activities are backpacking and camping, day hiking, mountain biking, and driving open unpaved roads. While in the backcountry visitors enjoy viewing scenery, taking pictures, studying nature, and viewing archeological or historical resources (Wood et. al. 1989).

Backcountry users are willing to expend the extra time, effort, and planning it takes for a backcountry trip in order to reap what they feel are the "rewards" of the backcountry: pristine scenery, solitude, wildness, and remoteness (Wood et al. 1989).

Glen Canyon NRA has a significant and unique backcountry offering a distinctive recreational opportunity for visitors. There are no maintained trails in the recreation area. Hikers, whether from lakeshore camps or from access roads in the backcountry, generally hike cross-country or rely heavily on canyon bottoms or drainage as routes into, through and out of the backcountry. The presence of livestock or grazing impacts has a negative impact on the recreational values and desired experiences of visitors within Glen Canyon NRA.

The hiker seeking an extended backcountry as opposed to day hikers from boats on Lake Powell and river runners appears to fall into the Natural Zone of the park, primarily the Orange Cliffs, Escalante, and Halls Crossing/San Juan areas. The General Management Plan defines management objectives for the Natural Zone; "Maintenance of isolation and natural processes. Consumption of renewable resources subject to protection of recreation values". In the Recreation and Resource Utilization Zone the only difference from the Natural Zone is that maintenance of isolation is not required. The Recreational and Resource Utilization Zone is often the zone visitors will travel through, perhaps even camp in, on their way to a destination in a Natural Zone.

Grazing is the most visible non-recreational use within Glen Canyon NRA. The largest number of negative comments from backcountry users is centered around cattle and grazing. These negative impacts include cattle visible in backcountry areas, cattle along road, cattle sign at campsites (both in the backcountry and on the lake and river shores), foul odor from cow manure, insects associated with cow manure, vegetation damage from cattle, trailing due to cattle, trampled cryptobiotic crusts, erosion from cattle, and water polluted by cattle (Wood et. al. 1989).

Cattle are not normally considered a part of the backcountry experience particularly in a unit of the National Park System. Backcountry users tend to have both strong expectations for their recreational experience, as well as strong opinions as to what is and is not appropriate backcountry activity (White 1979). These expectations and opinions have been incorporated into the Glen Canyon General Management Plan's management goals for the Natural and Recreation and Resource Utilization Zones.

Resource Goal and Objectives

Environmental Impacts:

Alternative 1 – Proposed Action

The National Park Service will ensure that proposed actions do not degrade the recreational enjoyment of those hiking in areas where grazing is permitted. To mitigate such impacts seasons of use may be established that have livestock off an allotment during seasons of heavy visitor use, fences may be installed to remove cattle from heavily used riparian or canyon routes, and actions may be required to remove cattle from heavily used lakeshore camping locations.

Alternative 2 – No Action

The National Park Service will continue to address conflicts between grazing related activities and recreational use on a case by case base as proposed actions are reviewed. Mitigation requirements for each case would be the same as in the Proposed Action.

Alternative 3 – Adopt BLM Standards and Guidelines

BLM S&G's incorporate law, regulations and policies as they apply to grazing on Public Land managed by BLM. They recognize recreational use of lands open to grazing but do not address recreational use as a primary use of those lands. Therefore there are no Guidelines that would mitigate grazing and recreation conflicts nor requires that steps be taken to protect or enhance visitor enjoyment.

Alternative 4 – Immediate Compliance

Immediate compliance may necessitate changes to existing permits and current Allotment Management Plans (AMP). It would preclude phasing in necessary changes that would occur under the Proposed Action when changes would be made as proposed actions or changes in current AMP's are evaluated.

Cumulative Impacts: Grazing will continue to be a source of recreational conflict in those areas where people recreate in active grazing allotments. Some users think that grazing should not occur in units of the National Park System and will continue to be negatively impacted by signs of grazing. Others view grazing as part of the historic "old" west and enjoy seeing this tradition carried on. Others have deep ties to the land and its use for agricultural commodities (forage, wood, minerals) or its environmental features and characteristics. Others enjoy the land for the type of lifestyle it provides, and because of a deep connection to or understanding of a "special" sense of place. Implementing the proposed action will help to balance most of these visitor expectations by an improved understanding of the users emotional attachments to special places, and their relationships

units of the National Park Service, expansive outdoor recreational opportunities on Bureau of Land Management (BLM) and U. S. Forest Service lands, rural ranching and farming operations, and Native American Indian cultures. The area is known for its vast open spaces, magnificent scenery, historic significance in the settling of Utah, and the numerous recreational opportunities it provides. The present state of communities in San Juan, Garfield, Kane and Wayne counties can be characterized as being small, sparsely distributed, and comprised of older individuals, relative to the State as a whole. The largest cities in the Glen Canyon NRA area are Blanding and Kanab, Utah and Page, Arizona with populations of 4,000, 4,400 and 8,000 respectively (The Devil's Bargain, 1997). The demographic characteristics for the region show that population growth is slow, reflecting few employment opportunities and high rates of unemployment (4.1 to 8.3 percent).

Since the early 1980's visitation to the region's National Park Units has increased 94 percent, to over 16 million visitor-days annually. This visitation has also spread to the towns, cities, State recreation areas, and tribal lands. Reflecting this increase in tourism, Southern Utah counties have seen a transition from a resource-based economy to a service-based economy. Where once the main economy was based on ranching, farming, mining, and timber, today tourism is the dominant economic force in many communities. Tourism can represent a significant source of income and jobs to a community, especially in an area blessed with abundant natural or historic resources. In Iron County, Utah the county lost 14-25 percent of its resource-based employment, while gaining 10-16 percent in service-based employment over the past 25 years. Garfield County has seen a similar trend over the same time frame losing 6 percent of its resource-based employment, and gaining more than 16 percent employment in the service-based industry. Nearly 70 percent of the non-agriculture employment in this county comes from the travel and recreation-related industry (The Devil's Bargain 1997; BLM 1998).

This trend is reflected within Glen Canyon NRA in the various grazing permittee's presence on the allotments they manage. The traditional ranching operation is being replaced with part-time operators that enjoy the lifestyle of ranching, but where ranching is not a full time business. Many work at other professions to make a living and use the cattle ranching to improve their lifestyle. Therefore, ranching contributes a smaller portion to their annual income, but a larger portion to their personnel happiness. This is true for over 50 percent of the permittees operating on Glen Canyon NRA lands.

The trend to part-time operators affects the management of the lands. Since many operators ride the range only on weekends, they see their herds only once or twice a month. This practice complicates federal oversight of the operation and makes field contact with the "absent" rancher more difficult. This in turn leads to some instances of poor cattle distribution, trespass situations and deterioration of range developments.

Glen Canyon NRA does not receive any of the grazing revenue from the grazing operations within

an operation of law, it may be considered for transfer for purposes other than grazing.

Environmental Impacts

Alternative 1 – Proposed Action:

There will be no direct impact to the permittee until a change in the grazing operation or allotment management is presented, as described in the Grazing Component of the General Management Plan (GMP). Once a change in the grazing operation is requested, or a range development is proposed certain allotment permittees will be required to implement the applicable actions proposed in the final plan. Sale or transfer of a permit will also require the NPS to complete a Values/Purposes Determination. There will be some increased level of cost to the permittee to comply with the new plan objectives and goals, but without knowing what developments or improvements are to be proposed, cost estimates cannot be presented. The costs incurred will depend on the condition of the allotment, extent or size of the proposed action, and the funding allocated by the BLM for range developments. It is intended that the costs will be similar to those costs associated in the private sector, and will reflect good land steward practices.

Alternative 2 – "No Action:"

There would be no additional impacts to the permittee if this alternative were implemented. Each proposal would be evaluated on a case by case basis, with the NPS Values and Purposes Determination being completed using the existing process. The process usually took an inordinate amount of time to complete, and did not always provide the permittee with information on how the decision was determined. However, this process would not apply to the selling or transferring of a grazing permit. Once the permittee received approval from the Superintendent, there were often questions on "why" and "how" the decision was selected. The new grazing plan (Alternative 1) clarifies this process and provides the information to the permittee on "how" the approval was determined and "why" the NPS is requiring the specific actions. This will ultimately allow for long-term planning of proposed range developments, and help to improve ranching operational efficiency.

Alternative 3 – Follow BLM Grazing S&G's:

BLM S&G's are in the implementation stage. Local socio-economic impacts are not fully understood and therefore cannot be estimated. Because this alternative does not address the full scope of resources within the recreation area, the economic effects of this alternative are potentially less than those in Alternative 1 and 4, but greater than Alternative 2.

Alternative 4 – Require immediate permittee compliance:

through the State Grazing Advisory Board by requiring funding of only those prioritized actions. Many projects would not go forward because of a lack of funding or because of a lower priority. The Board and BLM would most likely be pressed by the permittees for additional funds to deal with the immediate requirements imposed by this alternative. Those allotments in the "Improve" or "Custodial" category would require the greatest expenditure of funds. Any change in either of these allotment categories would likely have higher expenditures and costs in order to meet NPS requirements for resource goals, objectives and monitoring. The economic effects of this alternative on the ranching operation are expected to be greater than the other Alternatives.

Cumulative Impacts: Long-term impacts to the ranch operator cannot be determined until projects are proposed or until allotment priorities are established. There will be some overall additional costs to the permittee once the proposed action is implemented. The permittee may be required to expend more out-of-pocket money for monitoring and to comply with NPS goals or objectives when initiating a change in grazing practices. The amount of out-of-pocket expenses will depend on the range condition of the allotment, the size of the proposed action, and funding levels provided through the applicable State Grazing Advisory Board. Economic impacts to local or County governments is not expected to change as there are no major changes in ranch operations, nor are there major improvements or construction projects required by the proposed action. No large economic changes or costs are expected from the implementation of the preferred action or other alternatives, except for Alt. 4. The main benefit of the proposed action is improved range condition over the long-term, within Glen Canyon NRA, and better management direction and information on NPS grazing practices and policies within the recreation area.

Other Resources

There will be no impacts to the following resources if the proposed grazing plan component is implemented: Geology, wetlands or floodplains, recommended wilderness, farmlands, historic properties, or critical habitat of a Threatened or Endangered species.

IV. Consultation and Coordination

The following agencies, organizations and public have been consulted in the preparation of this document:

Arizona Department of Game and Fish
Phoenix, Arizona

Arizona Strip
Bureau of Land Management
St. George Field Office

Bureau of Land Management
Kanab Field Office

State Director
Bureau of Land Management
Salt Lake City, Utah

Bureau of Land Management
Henry Mountain Field Station

State Historic Preservation Office
Phoenix, Arizona

Bureau of Land Management
Monticello Field Office

Navajo Nation
Window Rock, Arizona

U.S. Fish and Wildlife Service
State Supervisor
Phoenix, Arizona

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Moab Field Office

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